# Kennedy NASA Procedural Requirements

**Effective Date:** **February 3, 2022**

**Expiration Date:** **February 3, 2027**

**Responsible Office:** **Spaceport Integration and Services**

# KENNEDY SPACE CENTER IONIZING RADIATION PROTECTION PROGRAM

**National Aeronautics and Space Administration**

**John F. Kennedy Space Center**

KDP-KSC-T-2120 Rev. Basic

## CHANGE LOG

| Date | Revision | Description |
|---|---|---|
| 5/1/15 | A-1 | Expiration date extended due to timing of Medical Environmental Support Contract ending and new contract starting. Subject matter expert is serving on a Source Evaluation Board and resources are limited until after contract change. |
| 11/10/2015 | A-2 | Additional extension granted due to the delay of the new contract and the subject matter expert's support to the Source Evaluation Board being extended. |
| 2/5/16 | B | Administrative changes to reflect new organization. Also modified Section 1.3.1, changing definition of Radiation Protection Committee Membership. |
| 7/3/2018 | B-1 | Administrative changes to update P.4 Applicable Documents, corrections to Table A, Radiation Incident Notification telephone numbers, and appendices A, B, and C. |
| 12/15/2020 | B-2 | Expiration date extended to allow for Center wide review, comment disposition, and processing of final signatures. The organization with document responsibility has been greatly involved with COVID-19 oversight and response. |
| 2/17/2021 | B-3 | Additional extension approved to allow for the KSC Radiation Protection Committee's review and approval of proposed changes to KNPR 1860.1 in accordance with requirements of the Center's Nuclear Regulatory Commission license. |
| 09/20/2021 | B-4 | Dispositioning of comments from Center wide review requires significant changes. Additional extension approved. |
| 2/3/2022 | C | Table of Contents automated. All hyperlinks updated. Numbering updated throughout. KEMCON changed to NEMCON throughout. Cape Canaveral Air Force Station (CCAFS) changed to Cape Canaveral Space Force Station (CCSFS) throughout. 45th Space Wing (45 SW) changed to Space Launch Delta 45 (SLD 45) throughout.<br>P.2 - Changed 30th Space Wing to Space Launch Delta 30<br>P.4 - Added KSC Form 28-184, Radiation Use Request Notification Record.<br>1.3.4.d – added "Use Supervisor/Custodian (US/C)."<br>1.3.5 – removed "g."<br>1.3.6.b – replaced "on behalf of the ARO in his/her absence." with "as the ARO's designated representative in their absence, or whenever they are unable to maintain direct supervision of the sources under their jurisdiction."<br>1.3.6 – added "c. The US/Cs shall have training and experience in radiation protection that is commensurate with the scope of proposed activities."<br>1.3.7.a - "controlled" changed to "restricted"<br>1.3.7.c – added "Users must route required notifications and requests through the ARO and await RPC approval."<br>1.3.15 – added "Government Projects" and clarified wording<br>2.2 - section "3.3.a" changed to "2.3.e" |

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|---|---|---|
| | | 2.3.c - added “3) A specific UA may be issued for periods not to exceed 1 year and may renewed annually”<br>2.4.a - “QQ” changed to “QG”<br>2.4.c.1) - updated form title<br>2.4.c.2) - “given” changed to “required” and “provided” changed to “maintained”<br>2.12.b - added “close calls”<br>2.13.a - added “Radiation Use Authorization (RUA)”<br>3.5.a.9) - “4.5.c.7)” changed to “3.5.c.7)”<br>3.5.b.3).(v) - removed “and one complete package copy”<br>3.5.c.4) - reworded<br>3.5.c.8).(ii), 3.5.c.9).(ii), 3.5.c.10).(ii), 3.5.c.11).(ii) - spelled out “Radiation Area”<br>3.5.g.2) - “It is the employee’s responsibility to provide a complete lifetime accumulative occupational radiation exposure record(s) to the employer” changed to “It is a monitored individual’s responsibility to provide a dose history for the current year, accounting for all sources of occupational exposure, to the KSC Radiation Protection Officer or designee.”<br>3.5.g.3) - removed<br>3.5.g.4) - changed to 3.5.g.3) and “lifetime cumulative totals (current NRD Form 4)” changed to “shall be issued dosimetry”<br>3.5.g.4).(ii) - removed form title<br>3.5.h. - Removed “NASA”, added “The decision to declare pregnancy is voluntary.”<br>3.5.r.4) - added “(iv) - Information required to be provided by the radiographer at the time of prior notification shall include:”<br>Removed (v), (v).(a), and (v).(b)<br>Appendix A Definitions - Removed “Major Radiological Source…”<br>Added “Radiation Worker…”<br>Appendix C References - k. updated title, p. updated title, q. added NASA Procedural Requirement (NPR) 8715.3, Added r., s., t., and u. |

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## PREFACE

### P.1 Purpose

This Kennedy National Aeronautics and Space Administration (NASA) Procedural Requirement (KNPR) provides basic Kennedy Space Center (KSC) Radiation Protection Program policies, requirements, and controls concerning the procurement, use, and handling of radioactive materials and ionizing radiation producing machines and devices.

### P.2 Applicability

a. This KNPR applies to all organizations including internal contractors only to the extent specified or referenced in the appropriate contracts, grants, or agreements and user elements under the jurisdiction or direction of NASA at KSC, NASA facilities located at the United States (U.S.) Space Force, Space Launch Delta (SLD) 45 and SLD 30, and other KSC worksites.

b. In this directive, all mandatory actions (i.e., requirements) are denoted by statements containing the term “shall.” The terms “may” or “can” denote discretionary privilege or permission, “should” denotes a good practice and is recommended, but not required, “will” denotes expected outcome, and “are/is” denotes descriptive material.

c. In this directive, all document citations are assumed to be the latest version unless otherwise noted.

### P.3 Authority

a. Kennedy NASA Procedural Directive (KNPD) 1860.1, KSC Radiation Protection Program

b. Nuclear Regulatory Commission Broad Scope License for Kennedy Space Center

### P.4 Applicable Documents and Forms

a. Title 10 Code of Federal Regulations (CFR), Parts 19, 20, 21, 30, 31, 33, 34, 71, 150, 170, and 171

b. Title 21 CFR Parts 1000-1050, Chapter 1, Subchapter J Radiological Health

c. Title 49 CFR Parts 100-177

d. NASA Procedural Requirement (NPR) 1800.1, NASA Occupational Health Program Procedures

e. KNPR 6000.1, Transportation Support System Manual

f. KNPR 8500.1, KSC Environmental Requirements

g. KNPR 8715.3, KSC Safety Procedural Requirements

h. KSC Form 7-49, Purchase Request [Supplies/Equipment or Property Turn-In]

i. KSC Form 7-526, Radioactive Material Transfer and Shipment Record (Outbound)

j. KSC Form 16-294, Radiation Training and Experience Summary (Ionizing Radiation)

k. KSC Form 16-295, Radiation Use Request/Authorization (Radioactive Materials)

l. KSC Form 16-353, Modification of Radiation Use Authorization (RUA)

m. KSC Form 28-34, Radiation Use Request/Authorization (Ionizing Machine/Device)

n. KSC Form 28-45, Radioactive Material Transfer Receipt

o. KSC Form 28-184, Radiation Use Request Notification Record

p. Department of Defense Form DD 1149, Requisition And Invoice/Shipping Document

q. U.S. Nuclear Regulatory Commission (USNRC) Form 4, Occupational Radiation Exposure History

**P.5 Measurement/Verification**

Triennial audit of the KSC Occupational Health Program by the NASA Headquarters Office of the Chief Health and Medical Officer and interim KSC self-audits.

**P.6 Cancellation**

This revision cancels KNPR 1860.1, Rev. B-4, KSC Ionizing Radiation Program.

*/original digitally signed 12-9-2021/*

Nancy P. Bray
Director, Spaceport Integration and Services

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# CHAPTER 1 GENERAL DESCRIPTION

## 1.1 Goal

This procedure defines guidelines and requirements regarding the approval, procurement, use, transfer and shipment, and disposal of sources of ionizing radiation. It provides general guidance concerning personnel monitoring requirements and emergency procedures and describes the basic organization and responsibilities of the Radiation Protection Program as they pertain to personnel health protection and regulatory compliance.

The provisions of this procedure apply to all NASA elements under KSC jurisdiction or direction including associated contractors, tenants, transients, principal investigators, and visitors who are involved with the activities mentioned within.

## 1.2 Objective

At KSC, and at any other location or facility under the purview of KSC, centralized control will be exercised over the use of radioactive materials and ionizing radiation producing machines and devices to ensure safe practices and operations, to preclude unnecessary exposure to personnel, and to limit exposure to levels which are "as low as reasonably achievable" (ALARA). All activities involving the use of sources of ionizing radiation shall conform to all pertinent Federal, state, and local regulations and controls. Personnel exposures will not be permitted to exceed applicable Federal or state regulatory limits except in the event of extreme emergency, as defined by relevant and applicable regulations and controls. The KSC Radiation Protection Program has been established to implement and maintain this policy.

## 1.3 Responsibilities

### 1.3.1 KSC Radiation Protection Committee

The Radiation Protection Committee (RPC) consists of three civil service executive members and civil service primary members from Communication and Public Engagement, the Office of the Chief Counsel, the Launch Services Program, Information Technology and Communication Services, Safety and Mission Assurance, Exploration Research and Technology Programs, Engineering, and Ground Systems Development and Operations Program plus others, as required. RPC executive members consist of the following:

Chair - Chief, Aerospace Medicine and Occupational Health Branch

Co-Chair - KSC Radiation Protection Officer (RPO)

Emergency Management Representative - NASA Emergency Management Officer

The KSC RPC shall:

a. Develop policies and requirements to ensure that adequate facilities, equipment, training, and operational and emergency controls are maintained for all operations using radioactive materials or radiation producing machines or devices.

b. Approve or disapprove all uses of such radioactive materials and radiation producing machines or devices at KSC.

c. Ensure the development and maintenance of KSC Ionizing Radiation Protection Program policies on behalf of the Center Director.

d. Review and approve uses of controlled ionizing radiation devices.

e. Advise the RPO in the execution of duties as designated in KNPD 1860.1.

f. Provide oversight of KSC radiological regulatory matters.

1.3.2 KSC Radiation Protection Officer

As designated by KNPD 1860.1, the KSC RPO is responsible for functional implementation and administration of the Radiation Protection Program at KSC. The KSC RPO shall:

a. Ensure that operations involving radioactive materials or radiation producing machines or devices are performed in accordance with applicable Federal, state, and local regulations and other pertinent health and safety standards.

b. Serve as the KSC liaison for formal contact and coordination with the USNRC and other agencies regarding licensing regulations and radiation protection matters in general.

c. Provide general surveillance over users of radiation sources.

d. Act as liaison officer for the KSC Radiation Protection Program to ensure compliance with the applicable regulatory agencies' requirements relative to all ionizing radiation related activities and regulatory matters for KSC.

e. Act as liaison officer between KSC and other nonregulatory agencies, parties, and contractors relative to ionizing radiation matters.

f. Provide technical guidance to KSC organizations on ionizing radiation related matters and act as the functional representative of the RPC.

g. Audit the recordkeeping systems of the Ionizing Radiation Protection Program for KSC, pertinent to applicable requirements for licenses, registrations, and reports.

h. Perform contract insight role by participating in contractor environmental health management team and government contract evaluation and performance meetings.

i. Assume technical control, initiating investigations and directing corrective actions in ionizing radiation incidents and emergencies for KSC, and coordinating mishap reporting and investigation requirements with the appropriate KSC Safety and Mission Assurance organization and KSC Protective Services Office, as appropriate.

j. Assure proper disposition of ionizing radiation records for all employees, both Government and contractor, upon termination of employment or transfer from KSC.

k. Represent the RPC and speak and act for KSC on matters of policy and procedures relating specifically to control of ionizing radiation sources for KSC.

l. Make interim approvals for the RPC subject to subsequent RPC ratification.

1.3.3 The NASA Environmental and Medical Contract (NEMCON) element for Health Physics (HP) supports the KSC RPO and acts as the functional representative for the KSC RPO. The NEMCON element for HP shall provide services to include:

a. Technical reviews and evaluations of radiation sources and their use.

b. Consultations with users of radioactive materials or radiation producing machines and devices.

c. Administering the KSC personnel radiation dosimetry program.

d. Maintenance of the ionizing radiation source inventory and the waste disposal program.

e. Surveilling of the KSC Radiation Protection Program by performing on-site inspections, surveys, and monitoring ionizing radiation uses and users, as required.

f. Maintain operational implementation of the Ionizing Radiation Protection Program for KSC under the direction of the RPO.

g. Provide an individual to act on behalf of the RPO in his/her absence and after formal notification by the RPO.

h. Maintain appropriate licenses and registrations with associated records and reports in compliance with applicable regulatory agencies' requirements.

i. Evaluate proposed uses of ionizing radiation sources, make recommendations, and provide input to the RPO on matters concerning ionizing radiation protection.

j. Act as the field representative of the KSC Ionizing Radiation Protection Program and as liaison between user organizations and the RPO on radiological matters.

k. Provide radiation protection training if needed for Use Authorization (UA) approval. Such training will be provided on a case-by-case basis and tailored to the intended Area Radiation Officer (ARO) and users’ activities involving ionizing radiation sources.

1.3.4 Heads of Primary Organizations

Heads of primary organizations shall:

a. Ensure all requests from their organizations for procurement, possession, use, transfer, or other disposition of controlled ionizing radiation devices are coordinated with and routed through the RPO to the RPC for approval prior to forwarding to the procurement officer, transportation officer, or other appropriate official.

b. Ensure the project leaders, technical representatives, and supervisors:

1) Are familiar with all policies and procedures governing radiation sources and devices.

2) Provide appropriate orientation and systems training for those personnel within their respective organizational responsibility.

3) Review projects, plans, and procedures involving the use of ionizing radiation sources and identify all controlled sources to the RPO for applicable UA approval.

c. Ensure procurement requests, Statements of Work (SOW) and Performance Work Statements involving radiation sources:

1) Stipulate compliance with KSC Ionizing Radiation Protection Program requirements.

2) Require all contractor ionizing radiation source user personnel who are terminating or transferring employment to be identified in accordance with the UA requirements.

d. Ensure the designation of a user organization ARO and Use Supervisor/Custodian (US/C). The ARO shall have training and experience in radiation protection that is commensurate with the scope of proposed activities and is satisfactory to the RPO.

1.3.5 Area Radiation Officers

AROs shall:

a. Ensure the safe use and accountability of the ionizing radiation device(s) under their control in accordance with the provisions specified and approved by the applicable KSC UA.

b. Ensure all sources of ionizing radiation under their jurisdiction have been identified and approved by the RPO.

c. Give prior notification to NEMCON HP of movement of controlled ionizing radiation devices.

d. Ensure all personnel utilizing sources of ionizing radiation under their jurisdiction are properly trained in safe practices for the possession and use of such sources and are oriented to the applicable regulatory and program requirements.

e. Ensure the individual users have been approved through the KSC Radiation Protection Program.

f. Provide immediate notification to NEMCON HP upon determination or suspicion of any accident or incident involving a potential overexposure of personnel.

1.3.6 Use Supervisor/Custodian

The US/C, as designated by the ARO, shall:

a. Ensure the operational implementation of control provisions and requirements levied by the applicable KSC approved UA.

b. Act as the ARO’s designated representative in their absence, or whenever they are unable to maintain direct supervision of the sources under their jurisdiction.

c. The US/Cs shall have training and experience in radiation protection that is commensurate with the scope of proposed activities.

1.3.7 Users

Users shall:

a. Ensure proper personnel access controls at all identified radiation restricted areas.

b. Observe applicable provisions of this KNPR and the specific control provisions and requirements as stated in the approved KSC UA.

c. Notify and collaborate with their AROs and supervisors when deviation from approved procedures, equipment, personnel, or planned schedules would necessitate a modification of the approved KSC UA.

d. Immediately notify the ARO and NEMCON HP of any real or suspected accident or incident involving a potential overexposure.

e. Immediately notify Safety and Mission Assurance of any close call or mishap involving a potential overexposure that could result in a loss of life, a permanent disability, hospitalization, extensive first aid, or lost workdays.

f. Record any close call or mishap involving a potential overexposure into the NASA Mishap Information System.

1.3.8 Safety and Mission Assurance

Safety and Mission Assurance shall:

a. Coordinate provisions of the KSC Safety and Mission Assurance Program with KSC Ionizing Radiation Protection Program provisions or with the KSC RPO, as necessary.

b. Review and monitor procedures from a safety standpoint involving the use, movement, and transportation of ionizing radiation devices, as required by KNPR 8715.3, as appropriate.

c. Provide safety surveillance of all activities involving the use of ionizing radiation devices as such activities relate to KNPR 8715.3.

d. Coordinate with the RPO on emergency operations concerning ionizing radiation devices.

e. Support enforcement of radiological controls established by the KSC Ionizing Radiation Protection Program and any applicable approved KSC UA.

1.3.9 Protective Services Office - Fire Protection

The Protective Services Office - Fire Protection shall:

a. Ensure that fire protection personnel are properly trained in personnel protective practices relative to fighting fires involving hazards associated with ionizing radiation sources.

b. Review and make final determination of requirements for the physical security of ionizing radiation sources.

1.3.10 Protective Services Office - Emergency Management

The Protective Services Office - Emergency Management shall:

a. Coordinate with the RPO or designated representative on the development of emergency plans and procedures relative to major emergency situations involving ionizing radiation devices which might significantly affect KSC operations or personnel safety.

b. Coordinate resources to support implementation of approved emergency plans and procedures as directed by the RPO relative to radiation sources.

1.3.11 KSC Contractor Logistics Offices

KSC contractor logistics offices shall:

a. Ensure identified controlled ionizing radiation devices are not released from KSC without approval of the RPO or designated representative.

b. Ensure outbound shipments of controlled ionizing radiation devices off KSC properties comply with applicable regulations and have been released for shipment by the RPO or designated representative.

c. Ensure inbound shipments of controlled ionizing radiation devices are identified and approvals are received from the RPO or designated representative.

1.3.12 Organizations responsible for Construction Activities

Organizations responsible for construction activities shall ensure that requests for construction, siting, and modifications of facilities and equipment involving ionizing radiation hazards have been reviewed and approved by the RPO.

1.3.13 KSC Office of Procurement

The Office of Procurement shall:

a. Ensure procurement requests for equipment which incorporates controlled ionizing radiation devices have been identified to the RPO prior to procurement.

b. Incorporate into all requests for proposal and invitations for bid (to include KSC Form 7-49) all ionizing radiation protection requirements identified by the heads of primary organizations in their purchase requests or SOW.

c. Ensure contractor compliance with the requirements of the KSC Ionizing Radiation Protection Program, to the extent delineated in their contract.

d. Include in contracts the requirement that all contractor personnel who have been associated with operations involving ionizing radiation devices and are terminating or transferring employment be identified in accordance with UA requirements.

1.3.14 Communication and Public Engagement

KSC Communication and Public Engagement shall coordinate public affairs activities involving announcements and releases concerning ionizing radiation hazards under KSC jurisdiction with the RPC or RPO.

1.3.15 Government Projects and NASA Programs Located at KSC

Government Projects and NASA Programs located at KSC shall ensure appropriate coordination through proper channels with the RPO for compliance with KSC Ionizing Radiation Protection Program requirements.

1.3.16 Human Resources Office

The Human Resources Office shall ensure all NASA and KSC civil service tenant employees who have been classified as radiation workers and are terminating or transferring employment have cleared through the occupational medicine and environmental health facilities.

# CHAPTER 2 GENERAL PROCEDURES

## 2.1 General Procedures

The following general procedures are provided to assist users of controlled ionizing radiation devices under the purview of the KSC Radiation Protection Programs.

a. All proposals for procurement and use of controlled ionizing radiation devices shall be submitted to the KSC RPC through the KSC RPO, or designee, for review and approval prior to procurement and use.

b. Approved KSC Ionizing Radiation Protection Program forms, as described in Chapter 3, shall be utilized in submittals to the KSC RPO through NEMCON HP.

c. All receipt, internal transfer, shipment, and excess or other disposition of controlled ionizing radiation devices shall be coordinated with and approved in advance by the KSC RPO or designee.

d. Responsible individuals designated in the approved UA (e.g., AROs, US/Cs) shall review plans and procedures to ensure such coordination and approval.

e. Constraints imposed upon the use of controlled ionizing radiation devices shall be no less than those required by applicable regulatory authorities and include any additional constraints deemed necessary by the KSC RPC or the KSC RPO.

f. Applicable records pertaining to the KSC Radiation Protection Program shall be maintained by the RPO or designee. Such records may include, but are not limited to, records of procurement, receipt, UA, exemption, licensing or registration, inventory, surveys, dosimetry, shipments, and investigations.

g. Controlled ionizing radiation devices transferred to, stored, or used on Cape Canaveral Space Force Station (CCSFS) by organizations under KSC purview shall also be approved by the SLD 45 Radiation Safety Officer (RSO).

1) This approval is accomplished by concurrence signature of the SLD 45 RSO on the appropriate KSC UA form.

2) Coordination is performed by the KSC RPO or designee and does not require separate submittals to the SLD 45 RSO by the user organization.

## 2.2 Procurement Authorization

All procurement requests for controlled ionizing radiation producing devices, except as specifically exempted by the provisions of Section 2.3.e. below, shall be accompanied by an explanatory statement or by the signature of approval from the KSC RPO.

## 2.3 Possession and Use Authorization

a. Authorization for possession or use of controlled ionizing radiation devices requires review by and approval of the KSC RPC and the KSC RPO. To begin the authorization

process, submittal of a completed use request authorization forms package, as outlined in Chapter 3 of this KNPR, is required.

b. These forms, in conjunction with any necessary supportive data, shall be submitted as soon as practicable, but not later than 45 days prior to the intended arrival of the source(s) at KSC.

c. Specific UA

1) A specific UA shall be issued subsequent to evaluation of information and data submitted on the appropriate KSC forms.

2) Attachments to these forms shall include all relevant data and information pertaining to the specified devices and use. Details of the type of information required is delineated in Chapter 3 of this KNPR.

3) A specific UA may be issued for periods not to exceed 1 year and may be renewed annually.

d. General Use Authorization (GUA)

1) A GUA may be issued under certain circumstances subsequent to evaluation of information submitted on appropriate KSC forms.

2) GUAs will usually pertain only to devices which represent a minimal hazard potential for personnel.

3) Use of devices under GUA may be subject to specific controls or restrictions.

4) GUA will normally be issued for indefinite periods of time.

e. Exempt UA

Radiation source(s) may be exempted from some or all of the KSC Radiation Protection Program control requirements if the specific source(s) have been appropriately analyzed and evaluated by NEMCON HP. The RPC and RPO will make final determination of device(s) or source(s) on exempt status.

### 2.4 User Qualifications

a. Prior to utilizing controlled ionizing radiation devices, individuals shall receive QG237 KSC Ionizing Radiation Safety Training or commercial equivalent, possess pertinent experience, have an understanding of the limiting provisions of the UA, and have received orientation covering at least the following topics:

1) General description of the applicable radiation type and associated biological effects.

2) Basic principles of radiation protection.

3) Radiation protection procedures relevant to intended use.

4) Provisions of this KNPR and appropriate Federal, state, and local regulations.

5) Emergency procedures.

b. Personnel subject to certain ionizing radiation hazards may be required to obtain additional training and medical certification as deemed necessary by the KSC RPC or the KSC RPO.

c. The ARO is responsible for ensuring US/C and users identified are properly trained in safe practices for the possession and use of such sources and oriented to the applicable regulatory and program requirements.

1) This training shall be documented on KSC Form 16-294.

2) Refresher training shall be required every three years and documentation of such maintained.

### 2.5 Hazard Analysis and Evaluation

The KSC RPO or designee shall evaluate each use request to assess the potential hazards associated with the possession and use of the ionizing radiation source. Additional information may be requested and site inspections or surveys may be used in the course of analysis and evaluation.

### 2.6 Radiation Protection Surveys

Surveys may be required to ensure compliance with procedures and controls described by the provisions of this KNPR. Also, based on the preliminary assessment of a use request, an initial survey may be required by the KSC RPO or designee, either prior to or in conjunction with initial use of the controlled ionizing radiation device(s).

### 2.7 Assigned Controls

In addition to compliance with applicable Federal, state, and local regulations, an individual UA may stipulate additional controls assigned by the KSC RPO as a result of unique source or operational characteristics.

### 2.8 Scheduling and Notifications

a. Based upon the potential hazard represented by the use of certain ionizing radiation devices, organizations responsible for use of such devices may be required to schedule use operations through the KSC scheduling system or to provide other prior notification of operations to NEMCON HP. Such requirements shall be specified in the UA, if required.

b. The user organization shall ensure all KSC Ionizing Radiation Protection Program support requirements for activities involving hazardous radiation sources, as stipulated in the approved KSC UA, are included in the appropriate KSC scheduling system document sections.

### 2.9 Waivers, Deviations, and Suspensions

a. Waivers of or deviations from the requirements described by this KNPR may be issued by the KSC RPO on an individual basis.

b. Authorization for possession and use of ionizing radiation devices may be rescinded at any time as a result of noncompliance with provisions of the applicable UA or other regulatory requirements.

### 2.10 Loss or Theft of Ionizing Radiation Devices

Loss or theft of controlled ionizing radiation devices shall be immediately reported to the KSC RPO or NEMCON HP. Refer to Chapter 4, Section 4.3, of this KNPR for emergency notification telephone numbers.

### 2.11 Unattended Ionizing Radiation Devices

Unattended controlled ionizing radiation devices shall be secured against unauthorized access at all times.

### 2.12 Incidents, Accidents, and Emergencies

a. All real or suspected incidents, accidents, or emergencies involving sources of ionizing radiation shall be immediately reported to the KSC RPO or to NEMCON HP. Refer to Chapter 4 for radiation incident notification requirements and telephone numbers.

b. Mishaps and close calls shall be reported as described by KNPR 8715.3.

### 2.13 Modification of Use Authorization

a. Changes to authorized use of ionizing radiation devices shall be coordinated with and approved in advance by the KSC RPO. This coordination and approval process may be initiated by submittal of KSC Form 16-353, to the KSC RPO or designee.

b. Requests for modification should be submitted as soon as practicable but in no case later than 30 days prior to implementation of the planned change.

c. Examples of changes requiring modification of UA include, but are not limited to, changes in approved procedures, location of storage or use, device operating parameters, personnel, or other associated equipment.

### 2.14 Annual Renewal

Specific UA will expire one year from effective date if request for renewal is not made to the KSC RPO through the Health Physics Office (HPO) for extension of the use period. Such renewal requests shall be submitted by the user on KSC Form 16-353.

Submittal of requests for extension of authorized period of use shall be made as early as possible but not earlier than 45 days prior to the expiration of the UA. Requests for extension must be received by the RPO not later than 30 days prior to expiration to preclude expiration of the UA.

# CHAPTER 3 CONTROL PROVISIONS AND GUIDELINES FOR SOURCES OF IONIZING RADIATION

## 3.1 General

a. Procurement, possession, use, and excess of sources of ionizing radiation under the purview of the KSC Radiation Protection Program require coordination with the KSC RPO and approval by the KSC RPC.

b. Notwithstanding such program approvals, the unique nature of certain radiation sources may cause regulatory agencies outside of NASA and KSC to require authorization or registration of the intended use, location, and specific licensing of such sources.

c. Outside authorization and registration of radiation sources would be required in addition to, and concurrently with, KSC Radiation Protection Program approval.

d. The provisions and guidelines described in this KNPR are provided to assist intended users of radiation sources with the effort to comply with NASA and KSC requirements as well as those of other regulatory agencies as they apply at KSC.

## 3.2 Licensing

a. Licenses issued by the USNRC or the state of Florida are required for possession and use of licensable quantities or concentrations of radioactive materials on pertinent areas of CCSFS and KSC.

b. Reciprocal recognition of other agreement state licenses may be approved by the RPC or RPO for possession and use of radiation sources authorized by such licenses.

c. Copies of all such licenses, pertinent supportive documentation, and reciprocity authorizations (if applicable) shall be provided to the KSC RPO through NEMCON HP, in conjunction with the use request or authorization package.

## 3.3 Registration

a. Certain radiation producing devices on pertinent areas of CCSFS and KSC may require specific registration by the state of Florida.

b. Copies of all such registrations shall be provided to the KSC RPO through NEMCON HP as part of the data submittal required for KSC Radiation Protection Program authorization of radiation producing machines and devices.

## 3.4 Areas of Jurisdiction

a. A USNRC license, reciprocal license authorization, or USNRC license exemption is required for use of licensable quantities and concentrations of radioactive material on CCSFS, NASA, and other Federal agency activities on KSC, and for areas outside the geographical limits of the U.S., but under the jurisdiction of the USNRC (U.S. territories, possessions, and protectorates).

b. Regulation of activities involving the use of radioactive materials in areas not designated above and the use of radiation producing machines or devices is the responsibility of the State of Florida unless preempted by some other Federal authority.

c. Space launched radioactive materials and radiation producing machines or devices are generally viewed as exempted from the jurisdiction of Federal and state regulatory purview while in space.

d. The KSC Broadscope License will be used to transfer radioactive materials from user organizations that will be processing/storing radioactive materials for launch at KSC/CCSFS. After launch the radioactive materials will be transferred off KSC's license back to the user organization's license for accountability purposes.

e. In cases where regulatory purview is unclear, the KSC RPO or designated representative shall be consulted for determination of regulatory jurisdiction.

### 3.5 KSC Required Authorizations and Provisions

a. General Provisions

1) A license, registration, reciprocal authorization, or petitioned exemption issued by the USNRC, an agreement state, or a non-agreement state to an individual or organization is not valid on KSC and CCSFS until the Radiation Protection Program approval has been obtained.

2) Any organization or individual functioning under KSC jurisdiction proposing to procure, use, store, transfer, or dispose of radiation sources must obtain authorization from the KSC RPC.

3) The KSC RPO is the focal point of the KSC Radiation Protection Program for such coordination and approval.

4) KSC UA is required (unless specifically exempted by the KSC RPO or RPC action) for:

(i) Byproduct, source, or special nuclear material (SNM).

(ii) Naturally occurring radioactive material in any form other, or quantity and concentration greater, than that found in the natural environment.

(iii) Accelerator produced radioisotopes.

(iv) Generally licensed items or devices acquired under the general license provisions of Title 10 CFR 31, General License to Own Byproduct Material, or issued under the provisions of an agreement or non-agreement state.

(v) Machines or devices whose purpose is to produce ionizing radiation or for which ionizing radiation is a byproduct of their operation.

5) Prior written authorization to procure for use or to transport radioactive materials or radiation producing devices onto KSC shall be obtained from the KSC RPO or designated representative.

(i) Radiation Protection Program authorization is also required for responsible individuals and for all documented instructions or procedures (and subsequent revisions) applicable to operations involving radiation sources.

(ii) This applies to requests and plans which involve the acquisition, possession, use, storage, and transfer or disposal of such radiation sources.

(iii) No operation or modification to an existing operation shall be initiated prior to issuance of KSC Radiation Protection Program authorization.

6) KSC Radiation Protection Program authorization of storage and use areas and facilities shall be obtained prior to commencing initial operations.

7) Overall inventory control and administrative accountability of all sources of radiation on KSC shall be maintained by the KSC Radiation Protection Program office.

8) Individual users and use organizations shall ensure inventory control and accountability for their sources and coordinate this effort with the KSC RPO or designated representative.

9) Radiation areas as described in paragraph 3.5 c.7) shall be posted and restricted by the user.

10) All personnel exposure to radiation sources on KSC and CCSFS shall be kept ALARA.

11) Any radioactive materials or radiation producing devices improperly or illegally transported onto KSC are subject to impoundment until either the irregularities are corrected and appropriate KSC authorizations are obtained or removal from KSC is arranged.

12) Noncompliance with KSC Radiation Protection Program requirements and provisions relative to the authorized use of sources of radiation shall result in the revocation or suspension of such authorizations and impoundment of sources.

b. Specific Provisions

1) KSC Radiation Protection Program authorization for the possession and use of ionizing radiation sources requires submittal of the appropriate completed KSC Radiation Protection Program form(s) for the type of source(s) along with any necessary supportive data.

2) Submittals shall be made as soon as practicable, but in no case later than 45 days (unless otherwise specified) prior to the intended receipt of the subject radiation sources.

3) The appropriate KSC forms required for specific types of radiation sources and the data submittal requirements for KSC Radiation Protection Program approval are described in the following subparagraphs:

(i) KSC Form 16-295, Radiation Use Request/Authorization (Radioactive Materials), shall be completed and submitted for evaluation of all intended uses of radioactive materials including sources incorporated in equipment, instrumentation, or devices.

In cases where applicability of program requirements is unclear to the user organization or cannot be otherwise determined, KSC Form 16-295 shall be submitted with Section I and II of that form completed for review and evaluation by the KSC RPO through NEMCON HP. Based upon this review, additional data and information may be requested as deemed necessary by the KSC RPO.

(ii) KSC Form 28-34, Radiation Use Request/Authorization (Ionizing Machine/Device), shall be completed and submitted for review and evaluation of all intending use of ionizing radiation producing machines or devices.

In cases where applicability of program requirements is unclear or cannot be otherwise determined, KSC Form 28-34 shall be submitted, with Sections I and II of that form completed for evaluation by the KSC RPO through NEMCON HP.

(iii) KSC Form 16-294, Radiation Training and Experience Summary (Ionizing Radiation), shall be completed and submitted for evaluation of all users, ARO, and US/C intended to possess and use the specific radiation sources.

(iv) KSC Form 16-353, Modification of Radiation Use Authorization, shall be completed and submitted for evaluation of any intended changes or modifications to applicable procedures, licenses or registrations, facilities, personnel, or equipment and materials described by the current KSC authorization. Submittal of modification requests shall be made no later than 30 days prior to such intended changes taking effect.

(v) Certain information is required to be submitted in support of a specific KSC radiation use request form. All documentation shall be submitted as a single complete original package as early as possible, but no later than 45 days (unless otherwise specified) prior to intended use. Elements of this complete package include, but may not necessarily be limited to, those described below.

(a) The appropriate Radiation Protection Program radiation use request and authorization form.

(b) USNRC or agreement state license(s) or other appropriate authorizations (i.e., registrations possessed by the requester to own, maintain, and use the specific radiation source). Copies of basic license or registration applications, subsequent amendments, and any pertinent correspondence between the regulatory agency and the licensee or registrant shall be submitted with the license or registration.

(c) All applicable operating and emergency procedures involving procurement, possession, and use of radiation sources for which KSC authorization is being requested.

(d) Completed original of KSC Form 16-294 for each individual user, the designated ARO, and the US/C who will use or control the source(s) of ionizing radiation.

(e) Name(s) and telephone number(s) of responsible individual(s) (ARO, US/C) assigned the control and accountability responsibilities for the source(s) at KSC.

(f) Approximate dates of intended arrival and departure of the source(s) of radiation to and from KSC, the proposed mode of transportation to be utilized, description and specifications of packaging and any special containment, and any shielding or special handling instructions, as applicable.

c. Radiation Area Identification and Access Control

1) All radiation areas on KSC shall be identified, posted, and restricted to prevent unnecessary exposure to personnel.

2) Identification of such areas shall be made by, or in coordination with, the KSC RPO or designee.

3) Normally, areas requiring posting and control as radiation areas shall be identified by the KSC RPO as part of the specific provisions of the UA.

4) User organizations shall ensure that all radiation areas under their control are properly posted and restricted and sources labeled.

5) Areas as defined herein shall be posted with appropriate signs, tags, labels, barriers, and notices or instructions, as specified.

6) A sufficient number of warning signs shall be used to adequately identify the restricted area.

7) Radiation Restricted Area (RRA)

An RRA is any area in which access is restricted for purposes of protection of personnel from unwarranted exposure to ionizing radiation.

8) Radiation Area (RA)

(i) An RA is any area accessible to personnel in which radiation levels could result in the individual receiving a dose equivalent in excess of two millirems (mrem) (20 MicroSievert [μSv]) in 1 hour at 30 centimeters from the radiation source or from any surface that radiation penetrates.

(ii) Such an area shall be conspicuously posted on a sign with black or magenta lettering on a yellow background bearing the radiation symbol and the words "CAUTION - RADIATION AREA."

9) High Radiation Area (HRA)

(i) An HRA is any area accessible to personnel in which radiation levels could result in the individual receiving a dose equivalent in excess of 100 mrem (one millisievert [mSv]) in 1 hour at 30 centimeters from the radiation source or from any surface that radiation penetrates.

(ii) Such an area shall be conspicuously posted on a sign with black or magenta lettering on a yellow background bearing the words "DANGER - HIGH RADIATION AREA."

10) Very High Radiation Area

(i) A Very High Radiation Area is any area accessible to personnel in which radiation levels could result in the individual receiving a dose equivalent in excess of 500 rads (5 gray units) in 1 hour at 1 meter from the radiation source or from any surface that radiation penetrates.

(ii) Such an area shall be conspicuously posted on a sign with black or magenta lettering on a yellow background bearing the words "GRAVE DANGER-VERY HIGH RADIATION AREA."

11) Airborne Radioactivity Area

(i) An Airborne Radioactivity Area is any area in which airborne radioactive materials are potentially present in concentrations which could exceed the limits specified by applicable regulatory agency requirements.

(ii) These areas shall be conspicuously posted on a sign with black or magenta lettering on a yellow background bearing the radiation symbol and the words "CAUTION - (or DANGER) AIRBORNE RADIOACTIVITY AREA."

12) Radioactive Material Storage Areas and Containers

Areas and containers in which radioactive materials are stored shall be posted on a sign or label with black or magenta lettering on a yellow background bearing the radiation symbol and the words "CAUTION - (or DANGER) RADIOACTIVE MATERIAL."

13) Ionizing Radiation Producing Device or Equipment

Devices which produce ionizing radiation shall be labeled "CAUTION - THIS EQUIPMENT PRODUCES X-RAYS WHEN ENERGIZED," or equivalent wording.

14) Contaminated Area or Item

(i) A contaminated area or item is any area or item where contamination levels exceed those specified in Table A.

(ii) Such areas or items shall be posted or labeled with appropriate signs, tags, or labels indicating radioactive contamination, and shall be treated as an RRA.

15) Area Identification Methods

(i) Radiation lettering (i.e., black or magenta lettering and yellow background), rope, and tape shall be used whenever possible to demarcate the extent of an RRA.

(ii) Where other barrier material without the characteristic radiation colors has to be substituted, a sufficient number of appropriate signs shall be employed to adequately identify the area and the nature of the existing hazard to ensure recognition by personnel.

d. Area Access Control

1) Access to radiation areas on KSC and CCSFS shall be restricted by the approved users.

2) Personnel shall not enter a radiation area without prior Radiation Protection Program authorization and appropriate dosimetric devices.
3) Violations of radiation areas by unauthorized personnel shall be viewed as incidents. In such cases, the user organization:

(i) Shall immediately secure operations.

(ii) Shall escort the violator out of the radiation area.

(iii) Shall obtain the individual's name, organization, badge number, and supervisor's name and telephone number.

(iv) Shall report the incident to the KSC RPO, or designee, as soon as possible for investigation.

e. Radiation Exposure Control

1) Radiation exposures to personnel on KSC and CCSFS shall be monitored and maintained at levels ALARA.

2) All operations involving the use of radiation sources shall be designed to conform to the principles of ALARA.

3) In all cases, operations involving potential radiation exposures shall be reviewed and evaluated and control provisions identified to minimize radiation exposure.

4) It is the responsibility of each individual involved in the use of radiation sources to use any reasonable means available to ensure the minimization of radiation exposure to themselves and to others from sources of radiation under their control.

5) In the absence of specifically identified external radiation exposure control provisions, all personnel shall employ the advantageous use of limiting stay times in radiation areas, maximizing distance from radiation sources (consistent with operational requirements), and employing any appropriate means of shielding available.

6) Radiological operations which would inherently result in internal deposition of radionuclides, excluding specifically approved medical procedures, shall not be performed on KSC or CCSFS.

7) Operations having a potential of resulting in internal deposition of radioactive materials as a result of an accident or incident shall include the identification and use of limiting provisions, control measures, and protective equipment to preclude such potential uptake.

f. Radiation Protection Guides (RPG) for Whole Body Total Exposure (external plus internal).

1) The amount of exposure to ionizing radiation that an individual is allowed to receive in any period of time is limited.

2) The following exposure guides are provided to identify the whole-body total exposure limits established for KSC.

(i) The limits are designed to be consistent with applicable regulating agencies' (USNRC, State of Florida, U.S. Department of Energy, Occupational Safety and Health Administration, etc.) exposure limit criteria and with recommendations of the National Council on Radiation Protection and the International Commission on Radiological Protection. Exposure limits are not to be viewed as exposure goals.

(ii) Any intended operation that could potentially cause limits to be exceeded shall be identified to the KSC RPO for review and evaluation.

(iii) All real or suspected overexposures shall be reported immediately to the KSC RPO for investigation and assessment.

g. Occupational Radiation Workers

1) Exposure is limited to a total effective dose equivalent (TEDE) of 5.0 Roentgen Equivalent Man (rem) (50 mSv) per year. TEDE is the sum of whole body deep-dose equivalent (from external sources) and committed effective dose equivalent for critical organs (from internally deposited radionuclides).

(i) Whole body includes the head, trunk, arms above the elbow, or legs above the knee.

(ii) Table B specifies additional external exposure limits for occupational radiation workers.

2) It is a monitored individual’s responsibility to provide a dose history for the current year, accounting for all sources of occupational exposure, to the KSC RPO or designee.

3) Individuals who require access into an area restricted or controlled (for purposes of radiation protection) and are likely to receive a dose exceeding 10 percent of the dose limit specified in Table B shall submit records of radiation doses to the KSC RPO received during the current year and shall be issued dosimetry prior to entering such an area.

(i) Where prior occupational dose records are not available for the current year, the annual allowable dose limit shall be reduced by 1.25 rem (12.5 [mSv]) for each quarter the individual was employed as an occupational radiation worker.

(ii) Previous occupational exposure history shall be documented on a properly completed USNRC Form 4, or equivalent.

4) Radiation exposure resulting from necessary diagnostic medical and dental procedures shall not be included in the determination of the total occupational radiation exposure status of the individual concerned.

h. Occupational Limits to an Embryo or Fetus

It is the employee's responsibility to declare pregnancy to the KSC RPO. The TEDE limit to the embryo or fetus of a declared pregnant worker shall not exceed 500 mrem (5.0 mSv) during the entire pregnancy. The decision to declare pregnancy is voluntary.

i. General Population (Non-Radiation Workers)

General population shall not be exposed to ionizing radiation in excess of 2.0 mrem (0.02 mSv) in any 1 hour or 100 mrem/year (1.0 mSv/year) TEDE.

j. RPG for Airborne and Waterborne Activity

The following guides are provided to identify the concentration limits for airborne and waterborne radioactivity. The limits are consistent with applicable regulatory agencies' restrictions.

1) In keeping with the KSC Radiation Protection Program objective of ALARA for radiation exposure to individuals, these guides are primarily intended to be addressed in emergency or contingency situations as the result of an accident or incident.

2) The guides are not intended for application in routine or programmed operations designed to introduce or to cause airborne or waterborne radioactivity concentrations greater than the appropriate regulatory agencies unrestricted area limits.

k. Unrestricted Area

1) The concentration above natural background of radioactive materials in breathing air in unrestricted areas shall not exceed levels derived from or listed in Chapter 64E-5, Florida Administrative Code (FAC), Table II, Column 1 (USNRC 10 CFR 20, Appendix B, Table 2, Column 1).

2) The guidelines and restrictions established in 64E-5, FAC (10 CFR 20.1302) shall apply on KSC.

l. Restricted Area

1) The concentration above natural background of radioactive material in breathing air in restricted areas shall not exceed levels derived or listed in Chapter 64E-5, FAC, Table I, Columns 2 & 3 (10 CFR 20, Appendix B, Table I, columns 2 & 3).

2) The guidelines and restrictions established in 64E-5 FAC (10 CFR 20.1202), shall apply on KSC.

m. Respiratory Protection

No allowance shall be made for respiratory protection in determining exposure concentrations except as provided in 64E-5 FAC (10 CFR 20, Subpart H).

n. Waterborne Concentrations

Concentrations of waterborne radioactive materials above natural background released to unrestricted areas, via effluents or sanitary sewerage, shall not exceed the limits derived or listed in Chapter 64E-5 FAC, Table II, Column 2 or Table III (10 CFR 20.1202, Appendix B, Table 2, Column 2 or Table III).

o. RPG for Surface Contamination

1) The following guides are provided to identify the surface contamination limits for KSC:

(i) The KSC Radiation Protection Program policy requires the control of radioactive materials in such a manner as to preclude radiological contamination.

(ii) In the event of an accident or incident involving radioactive material which results in radiological contamination, the limits specified shall be adhered to as minimum criteria pertaining to decontamination efforts.

(iii) Notwithstanding the limits specified, every effort shall be made to decontaminate to levels as low as possible as approved by the KSC RPC and RPO.

2) The limits specified in Table A of this KNPR shall be attained through the process of radiological decontamination of facilities, materials, and equipment prior to release for unrestricted use.

(i) Notwithstanding the specified limits, all decontamination procedures shall receive prior approval from, and be conducted under, the supervision of the KSC RPO or designee.

(ii) Any item or area which has been decontaminated shall receive written clearance from the KSC RPO or designee before being released for unrestricted use.

3) Attempts shall be made to decontaminate all personnel to nondetectable levels (externally).

(i) Personnel shall not be released until localized skin contamination is reduced to background levels.

(ii) Special measures shall be employed concerning individuals believed to have sustained internal contamination.

(a) Decontamination shall be followed by nasal swabs and in vivo or in vitro assay as directed by the KSC RPO or designee.

(b) Attempts may be made, under medical direction and supervision, to remove internal contamination by use of chelating agents or other appropriate means.

4) All decontamination operations shall be carried out under the supervision and direction of the KSC RPO or designee, and under such conditions as to minimize the possibility of cross contamination of other areas or personnel.

5) During decontamination operations every consideration shall be given to efforts directed toward prevention of resuspension of surface contaminants.

6) Personnel involved in decontamination activities shall be appropriately trained in personnel protection methods, hazards associated with decontamination operations, and contamination control.

(i) Personnel shall be equipped with appropriate anticontamination clothing, exposure-monitoring devices, and respiratory protection devices as specified by the KSC RPO or his designee.

(ii) Personnel shall enter and exit through established control points for purposes of access and contamination control.

(iii) Approved HP practices shall be followed and records maintained on all personnel participating in decontamination activities.

(iv) Selected individuals may, depending upon contamination levels and the nature of operations performed, be required to undergo in vivo evaluations and submit bioassay samples. Such need and selection of personnel shall be determined by the KSC RPO or designee.

7) Other personnel performing normal job functions in areas adjacent to contaminated areas shall be briefed on any potential radiological hazards near their location and in no case be subjected to situations which would endanger their health or safety.

p. RPG for Transportation, Receipt, and Shipment of Ionizing Radiation Sources on KSC

1) The following guides are provided for transportation of radiation sources. These guides apply to radioactive materials and spacecraft or payload elements containing such items.

(i) All such activities shall be in accordance with the requirements described by KNPR 6000.1 and identified in advance to the KSC RPO or designee.

(ii) Transportation within KSC and CCSFS boundaries shall be in accordance with the following:

(a) Transportation and movement of radiation sources exclusively within KSC (or NASA and KSC to and from CCSFS) shall be performed only after notification has been provided to, and authorization received from, the KSC RPO or designee.

(b) Transportation and movement of sources on or to CCSFS shall be coordinated with the SLD 45 RSO and NEMCON HP.

(c) NEMCON HP shall be notified at least two hours prior to scheduled movement of radiation sources if such notification is a specific provision of the KSC approved UA.

(d) Requests for transportation authorization shall include the following information:

(1) Name of person (ARO, US/C) responsible for the procedure.

(2) Identification of the source (isotope, form, type, activity).

(3) Type of vehicle.

(4) Point of origin and delivery.

(5) Name of authorized receiver, if applicable.

(6) Description of container and shielding.

(7) Proposed route of travel.

(8) Special handling equipment.

(9) Procedures, restrictions, and precautions.

(e) The ARO or US/C is responsible for ensuring that the material and shipment, including the transport vehicle, has been properly monitored and that marking and labeling of the material and transportation vehicle is in compliance with requirements of applicable transportation regulations.

(f) The ARO or US/C shall obtain receipt signature of the authorized receiver on shipping documents and provide copies of the shipping voucher to the receiver, the applicable RPO or designated representative, and the appropriate supply officer representative.

(iii) Transportation to and from KSC and CCSFS:

(a) Transfer of radiation sources shall be in accordance with applicable state and Federal Department of Transportation (DOT) regulations (Chapter 64E-5 FAC, Part XV Transportation of Radioactive Material), Title 49 CFR Part 173, and International Air Transport Association (IATA) Dangerous Goods Regulations.

(b) All such transfer activities shall be coordinated and approved, in advance, through the applicable KSC RPO or designated representative.

(c) Shipments of radioactive materials require completion of Department of Defense Form DD 1149, (or Request for Shipping Document), KSC Form 28-45, and KSC Form 7-526.

(iv) Vehicle Placarding

(a) Motor vehicles or trailers used to transport radioactive material requiring a DOT "Radioactive Yellow III" label, regardless of the quantity, shall display markings or placards showing "RADIOACTIVE."

(b) Placards or markings shall be displayed at the front, rear, and on each side of the motor vehicle, trailer, or other cargo-carrying body while it contains any quantity of "Radioactive Yellow - III" labeled material.

(c) The front marking or placard may be displayed on the front of either the truck, truck body, truck tractor, or the trailer, but the area of display shall not have any other markings, lettering, or graphic display for at least three inches in each direction.

(d) Loss, theft, or accident involving radiation sources in transit shall be immediately reported to the local emergency response and security agencies and to the KSC RPO or designee. (See Chapter 4, section 4.3 for radiation incident notification requirements and telephone numbers.)

(e) Unless otherwise specifically exempted by the KSC RPO, any organization on KSC receiving radioactive material or devices which produce ionizing radiation shall notify NEMCON

HP prior to delivery or pick-up by the user organization and give a description of the material and the destination.

(f) Each receiving organization shall have a designated restricted access storage area for short-term holding of such materials.

(g) Under no circumstances shall such material be released to the consignee or user until NEMCON HP has been notified.

(h) Transportation vehicles carrying packages labeled with "Radioactive Yellow-III" labels, or other as designated by the KSC RPO, shall not be allowed to unload packages until the vehicle has been surveyed by NEMCON HP.

q. RPG for Medical X-Ray Equipment

1) The basic objective of the medical use of radiation is to obtain optimum diagnostic information or therapeutic effect with minimum exposure to the patient, to medical personnel involved, and to the general public.

2) The general guidelines presented below are for the purpose of minimizing unnecessary radiation exposure of personnel.

3) In addition to KSC Radiation Protection Program requirements and provisions for ionizing radiation producing equipment specified in other parts of this chapter, the design and operational guidelines for medical x-rays presented in the following documents apply to KSC.

(i) National Council on Radiation Protection and Measurements (NCRP) Reports 102 and 147 dealing with Medical X-Ray, Electron Beam and Gamma-Ray Protection and shielding design for Energies up to 50 MeV.

(ii) 21 CFR Parts 1000-1050, (Chapter 1, Subchapter J, Radiological Health).

(iii) Federal Guidance Report No. 14, Radiation Protection Guidance for Diagnostic and Interventional C-Ray Procedures (2014).

(iv) Chapter 64E-5, FAC, "Control of Radiation Hazards" Part VI.

4) Equipment shall be operated only by qualified, KSC authorized personnel.

(i) Medical x-ray equipment on KSC shall be operated by KSC authorized personnel who are properly trained and qualified in subject matters to include radiation protection, safe operation of equipment, biologic effects of ionizing radiation, and exposure-limiting techniques.

(a) Operator trainees may be permitted to use such equipment when under the direct supervision of a qualified, KSC authorized operator.

(b) Such training activities shall not incorporate the use of human subjects.

(ii) The following general provisions shall be followed by all personnel involved in the use of medical x-ray units.

(a) All operational personnel shall be appropriately monitored during radiation exposures as required by the applicable UA or KSC RPO instructions.

(b) Dosimetric devices shall be worn outside lead aprons when aprons are worn and stored outside of radiation areas when not in use.

5) Personnel shall be allowed to hold patients during x-ray exams only in emergency situations.

6) Only persons required for the radiographic operation shall be in the radiographic room during exposures.

7) The useful beam shall be limited to the smallest area practicable and consistent with the objectives of the examination.

8) The operator shall stand behind a shielded protective barrier during exposures.

9) Radiographs shall only be authorized by a licensed practitioner of the healing arts.

10) Individuals shall not be exposed solely for the purpose of demonstration or training.

11) A quality control program shall be initiated to reduce exposures through optimization of techniques, preventive maintenance of equipment, proper image processing, and equipment calibration.

12) Lead sheets, gonadal shields, or aprons shall be used to protect critical organ areas of the patient whenever possible.

13) An initial radiation protection survey shall be performed by the KSC RPO or designee on all facilities and copies maintained on file in the appropriate x-ray department or with the responsible individual (ARO).

14) A re-survey is required for any of the following reasons:

(i) When new radiographic units are installed.

(ii) After major changes in equipment, workload, or procedures which could potentially increase the hazard present.

(iii) Not to exceed two-year intervals or at the discretion of the KSC RPO or designated representative.

15) All requests for radiation protection surveys shall be directed to NEMCON HP.

r. RPG for Industrial Radiography

1) This chapter provides specific guidelines for organizations which may possess, use, and maintain industrial radiographic sources on KSC.

2) The KSC Radiation Protection Program policy of restricting exposures to ALARA from industrial radiographic sources or operations shall be strictly followed.

3) General Guidelines

(i) The Radiation Protection Program guidelines described herein are applicable to industrial radiography use organizations and operations.

(ii) Applicable provisions identified in the KSC Radiation Protection Program UA and USNRC or State of Florida license provisions and regulations also apply.

(iii) All radiation areas in which personnel may be present (or have the potential) shall be appropriately identified and access restricted.

(iv) Operations during hours of darkness shall require that warning signs be properly illuminated and flashing red lights used to identify the restricted area.

(v) Coordination of planned radiographic operations with responsible scheduling agencies, launch complex and facility supervisors, and the KSC RPO or designee is the responsibility of the radiographer and the organization requesting the service.

(vi) A copy of current leak test certification shall accompany each radiography source (material) if such certification is not currently on file with the HPO. A leak test must have been performed within the previous six months.

(vii) Appropriate dosimetric (whole body) badges and alarming rate meters or paired pocket dosimeters (direct reading type) as specified or approved by the KSC RPO shall be worn by each individual involved in radiographic operations.

(a) If a pocket dosimeter or alarming rate meter worn by an individual is read to be "off-scale," greater than 200 mrem (>2 mSv), an emergency situation will be assumed to exist and the individual(s) shall immediately secure operations and notify the KSC RPO or designated representative.

(b) Pocket dosimeters shall be charged (zeroed) at the beginning of each working day.

(c) Electronic and pocket dosimeters shall be calibrated at intervals not to exceed 12 months.

(d) Care must be taken to prevent mechanical shock to dosimeters or ratemeters and to protect such devices from excessive moisture and heat.

(e) Dosimetry badges shall be stored in areas protected (shielded) from radiation when not in use.

(f) Personal audible alarming rate meter shall be preset to alarm in radiation levels >500 milliroentgens/hour (hr) and be calibrated at intervals not to exceed 12 months.

(viii) A minimum of two calibrated radiation survey meters capable of and appropriate for detection of the type and energies of the radiation involved shall be used for radiographic operations.

(a) Radiation survey meters used in industrial radiography shall be calibrated every six months.

(b) Calibration records shall be maintained for each calibration.

4) Radiography Notification Requirements

(i) Notification of intended radiographic operations by offsite organizations shall be made by the radiographer no less than eight hours prior to planned operations with verification notification upon arrival at the site.
(ii) Telephone numbers are listed in Chapter 4 of this KNPR. If the proposed operation is canceled or postponed, or the time is changed prior to commencement of the operation, the radiographer shall notify the appropriate parties of such changes.

(iii) Onsite (KSC) radiography organizations shall notify the KSC RPO or designee of intended operations upon being assigned a specific radiographic task.

(iv) Information required to be provided by the radiographer at the time of prior notification shall include:

(a) Name of radiographic organization.

(b) Names of radiographers and radiographers' assistants.

(c) Location, date, and time of operation.

(d) Item(s) to be radiographed.

(e) Type of radiography source (isotope, machine, etc.).

(f) Strength of source.

(g) Estimated number of exposures.

(h) Estimated duration of exposures.

5) All radiographic operations require a minimum of two KSC authorized individuals to be present during the conduct of radiographic operations.

6) Radiation areas established during radiographic operations shall be under constant control and surveillance by the radiographer(s) during the entire operation.

7) In the event of theft or loss of radiation source(s), real or suspected overexposures, accidents involving ionizing radiation sources, or other unusual incidents and occurrences involving such sources, the KSC RPO, or designated representative, shall be notified immediately. (See Chapter 4, section 4.3 for radiation incident notification requirements and telephone numbers.)

8) All radiography source change-out procedures shall be coordinated in advance with the KSC RPO or designated representative.

9) Guidelines for Fixed Installations

(i) In addition to the general guidelines above and the specific provisions of KSC Radiation Protection Program UA for such facilities, some or all of the following guidelines shall be applied to fixed radiographic installations as deemed necessary by the KSC RPO.

(a) Review and approval by the KSC RPO of the design for construction of a facility or modification to an existing facility to be used for radiographic operations.

(b) Use of an independent radiation monitor with alarm capability within the radiography cell.
(c) Use of interlocked doors and access ports to the radiography room to terminate the exposure if intrusion occurs.

(d) Assurance of access control by KSC Radiation Protection Program authorized users of the facility.

(e) Employment of key-interlocked mechanisms to facilitate system shutdown and control.

(f) Proper posting of facilities with appropriate radiation hazard warning signs.

(g) Appropriate security controls on gamma camera storage areas.

10) Guidelines for Temporary Job Sites

(i) In addition to the general guidelines listed and the specific provisions of the KSC Radiation Protection Program's approved UA for radiographic operations, the following guidelines are applicable to radiographic operations at temporary job sites.

(a) RAs shall be established and verified by survey by the radiographer.

(b) RAs shall be properly posted with appropriate radiation hazard warning signs.

(1) At a minimum, RA signs (at the 2 mrem/hr [20 uSv/hr] boundary) shall be posted in sufficient numbers to adequately identify the area and provide ample warning to approaching personnel.

(2) HRA signs (at the 100 mrem/hr [1 mSv/hr] boundary) shall be posted in sufficient numbers to adequately identify the HRA associated with the radiographic operation(s).

(c) Whenever possible, physical restraining barriers shall be used in conjunction with appropriate radiation hazard warning signs to preclude access to restricted areas by unauthorized personnel.

(d) In the event that violation of the restricted area by an unauthorized individual occurs, the radiographer shall:

(1) Immediately secure the radiographic operation.

(2) Escort the individual out of the restricted area.

(3) Obtain the name and organization of the individual and appropriate supervisor's name and telephone number.

(4) Record pertinent data involving the incident.

(5) Report the incident and provide information from (3) and (4) above to the KSC RPO or designated representative. (See Chapter 4, section 4.3, for radiation incident notification requirements and telephone numbers.)

(e) In the event that a source cannot be retracted into its storage container or becomes disconnected from the control mechanism, the radiographer shall:
(1) Immediately secure the operation.

(2) Maintain control over the area.

(3) Notify the KSC RPO or designated representative. (See Chapter 4, section 4.3 for emergency notification telephone numbers.)

11) RPG for Radioactive Waste Disposal

(i) The following guidelines are provided for user organizations on KSC that generate or temporarily possess radioactive waste.

(ii) All radioactive waste shall:

(a) Be strictly controlled.

(b) Disposal shall be in accordance with KSC Radiation Protection Program approved procedures.

(iii) Procedures for control of radioactive waste shall be designed to preclude the release to or contamination of the local environment by any radioactive material.

(iv) Radioactive waste burial or release to the environment at KSC is prohibited unless specifically approved by the KSC RPC.

(v) Radioactive wastes include unusable radioactive items, manufactured items or articles containing radioactive sources, or substances contaminated with radioactive materials.

(vi) ARO and use supervisors are responsible for maintaining records of radioactive waste accumulated within their areas.

(a) Temporary storage of such waste shall be authorized by the KSC RPO.

(b) Records shall include isotope identity, date of preparation and activity, and date placed in storage.

(c) Periodic exposure readings shall be taken at the surface of the storage container and recorded.

(d) Frequency of surveys will depend on the rate of accumulation of waste but shall generally be a quarterly requirement as a minimum.

(vii) No radioactive waste material shall be disposed of or removed from KSC by the individual user without prior approval of the KSC RPO or designated representative.

(viii) In the absence of other approved prior arrangements, waste material shall be collected and disposed of by the NEMCON HP on KSC and CCSFS using methods consistent with all applicable regulations and accepted radiation protection practices.

(ix) Radioactive waste (dry, liquid, and sharps) shall be placed into appropriate containers for disposal.

(x) User organization shall maintain utilization and accumulation logs indicating radioisotope, approximate amount, activity, physical state, and date.

(xi) All radioactive waste generated shall be disposed of by a qualified offsite contractor.

(a) The selected organization shall be contacted by representatives from the user organization to arrange for pick-up and disposal of the waste.

(b) The KSC RPO shall be notified in advance of all shipments of radioactive waste.

(xii) All biohazardous materials mixed with radioactive waste shall be decontaminated prior to disposal.

(xiii) After the biohazard or radioactive component is eliminated, the waste shall be handled as appropriate (i.e., either radioactive or biohazardous).

(xiv) Operations should be avoided that have the potential to create mixed waste (i.e., radioactive and other hazardous agents mixed together).

(xv) Prior arrangements and approvals shall be made before performing any operations which may result in generation of a mixed waste. This includes:

(a) Completion of a "Process Waste Questionnaire" prior to generation of a mixed waste. (Reference KNPR 8500.1, KSC Environmental Requirements)

(b) Prior approval from KSC RPO.

**Table A**
**Acceptable Surface Contamination Levels**

| NUCLIDES(1) | AVERAGE(2)(3)(6) | MAXIMUM(2)(4)(6) | REMOVABLE(2)(5)(6) |
|---|---|---|---|
| U-nat, U-235, U-238, and associated decay products | 5,000 disintegrations per minute (dpm)/100 centimeters squared ($cm^2$) | 15,000 dpm/100 $cm^2$ | 1,000 dpm/100 $cm^2$ |
| Transuranies, Ta-236, Ra-238, Th-230, Pa-231, Ac-227, I-125, I-129 | 100 dpm/100 $cm^2$ | 300 dpm/100 $cm^2$ | 20 dpm/100 $cm^2$ |
| Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133 and | 1,000 dpm/100 $cm^2$ | 3,000 dpm/100 $cm^2$ | 200 dpm/100 $cm^2$ |
| Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except SR-90 and other noted above | 5,000 dpm/100 $cm^2$ | 15,000 dpm/100 $cm^2$ | 1,000 dpm/100 $cm^2$ |

Adopted from *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Use Termination of Licenses for By-product Source, or "NUREG-1556 Volume 11, Rev. 1, Consolidated Guidance About Materials Licenses. Program-Specific Guidance About Licenses of Broad Scope, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, (2017).

Guidelines

1. Where surface contamination by both alpha and beta-gamma-emitting nuclides exists, the limits established for alpha and beta-gamma-emitting nuclides should apply independently.

2. As used in tables, dpm means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

3. Measurements of average contaminant should not be averaged over more than one square meter. For objects of less surface area, the average should be derived for each such object.

4. The maximum contamination level applies to an area of not more than 100 cm2.

5. The amount of removable radioactive material per 100 cm2 of surface area should be determined by wiping that area with a dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally, and the entire surface should be wiped.

6. The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 (milliroentgens) mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

**Table B**
**Occupational Radiation Worker Dose Limits**

| Exposure Period | Whole Body (Deep Dose) | Lens of the Eye | Skin or to any Extremity (Shallow Dose Equivalent) |
|---|---|---|---|
| Quarterly | 1,250 mrem (12.5mSv) | 3,700 mrem (37 mSv) | 12, 500 mrem (125 mSv) |
| Yearly | 5,000 mrem (50 mSv) | 15,000 mrem (150 mSv) | 50,000 mrem (500 mSv) |

Radiation doses from routine operations shall not exceed the above limits.

Approval to exceed the above limits shall be obtained from the KSC RPO and follow current applicable regulatory guidelines.

Requests for such approval shall include explanation of requirements and adequate justification.

# CHAPTER 4 RADIATION INCIDENT GUIDELINES AND NOTIFICATIONS

## 4.1 General

Radiation incidents may result in exposures or radioactive contamination which can spread or be dispersed in situations such as fire, flood, explosion, spillage, or breach of containment.

## 4.2 Basic Emergency Procedures

a. Isolate the contamination (Ionizing)

1) Close doors, windows, etc.

2) Shut down air handling systems, lab hoods, etc.

b. Evacuate personnel

1) Evacuate personnel to a safe upwind marshaling area and detain.

c. Notify appropriate response elements

1) See section 4.3 of this chapter for notification requirements and telephone numbers.

2) Emergency response elements (fire, medical, and security) as determined necessary.

3) KSC RPO or designated representative.

d. Standby activities for affected area personnel

1) Control unauthorized access to the area.

2) Inform response element(s) of the nature of the radiological hazard (e.g., type and quality of material).

3) Detain evacuated personnel in marshaling area until released by the RPO or designated representative.

e. Personnel conduct

1) Unauthorized personnel shall not attempt to survey or clean up the spillage (contamination).

2) Personnel leaving a contaminated area shall keep their movements to a minimum to avoid spreading the contamination.

3) Survey and decontamination efforts shall be conducted under the supervision of the KSC RPO or designated representative.

## 4.3 Radiation Incident Notification

a. Notification requirements

1) Radiation incidents involving fire, explosion, personnel injury, or facility damage requiring emergency response by medical, fire, or security elements shall be reported by calling the appropriate emergency number (See paragraph 4.3 b).

2) Caller shall identify the radiation source and describe its involvement in the emergency.

3) All other radiation incidents not requiring emergency notification (e.g., isolated spills, source damage, loss of source control or accountability, suspected exposure or contamination) shall be immediately reported to the KSC RPO or designated representative.

b. Telephone Numbers

1) All-hours emergency response (medical, fire, security) operations occurring on KSC and CCSFS dial 911 from a land-based phone.

(i) If calling from cell phone on KSC, dial (321) 867-7911.

(ii) If calling from cell phone on CCSFS, dial (321) 853-0911.

2) Normal duty hours (0730-1630) radiation incident.

| | |
|---|---|
| KSC RPO | (321) 867-6958 |
| NEMCON HP | (321) 867-2400 |
| KSC Emergency Management Officer | (321) 867-8723 |
| SLD 45 RSO | (321) 494-9030 |

3) After normal duty hours (0730-1630), or on holidays and weekends, dial (321) 861-5050.

4) Listings above are subject to change without notice or may not be applicable to your area.

5) Consult the local installation telephone directory for current listings and for areas not listed.

## Appendix A Definitions

A.1 AREA RADIATION OFFICER (ARO) - The individual designated by the user organization's management as their representative for matters pertaining to the local control of radiation hazards.

A.2 DOSIMETER - Any device that detects and measures accumulated radiation dose.

A.3 HAZARD SURVEY - An onsite technical inspection of material, systems, or devices covered by RUA. Such a survey may involve the physical measurement of radiation levels and the evaluation of precautionary control measures, as applicable.

A.4 HEALTH PHYSICS (HP) - The profession and science concerned with the protection of people and the environment from unnecessary exposure to radiation, through understanding, evaluation, and control of the risks from radiation exposure relative to the benefits derived.

A.5 IONIZING RADIATION - Electromagnetic or particulate radiation capable of producing ions, directly or indirectly, in its passage through matter.

A.6 LICENSED MATERIAL - Any material received, possessed, used, or transferred under a general or specific license issued by the USNRC or an agreement state.

A.7 MODIFICATION OF RADIATION USE AUTHORIZATION - Formal submittal format for data and information pertaining to a change in personnel, facilities equipment, or procedures, affecting an existing approved RUA.

A.8 RADIATION INCIDENT - Any unusual occurrence, accident, or emergency involving a radiation source(s).

A.9 RADIATION USE REQUEST/AUTHORIZATION - Formal submittal format for data and information pertaining to the proposed acquisition, use, and storage of radiation sources.

A.10 RADIATION WORKER - An individual authorized by the KSC Radiation Protection Committee to work with radioactive materials and operate radiation-producing equipment or frequent controlled areas.

A.11 USER - Any individual designated and approved by the KSC RPC to possess or use radiation sources on KSC.

A.12 USE SUPERVISOR/CUSTODIAN (US/C) - Designated onsite user who is authorized to act on behalf of the ARO during ARO absence.

## Appendix B Acronyms

| | |
|---|---|
| ALARA | As Low As Reasonably Achievable |
| ARO | Area Radiation Officer |
| CCSFS | Cape Canaveral Space Force Station |
| CFR | Code of Federal Regulations |
| $cm^2$ | Centimeter Squared |
| DOT | Department of Transportation |
| dpm | Disintegrations Per Minute |
| FAC | Florida Administrative Code |
| GUA | General Use Authorization |
| HP | Health Physics |
| HPO | Health Physics Office |
| HRA | High Radiation Area |
| IATA | International Air Transport Association |
| KNPD | Kennedy NASA Policy Directive |
| KNPR | Kennedy NASA Procedural Requirement |
| KSC | Kennedy Space Center |
| mrem | Millirems |
| mSv | Millisievert |
| NASA | National Aeronautics and Space Administration |
| NCRP | National Council on Radiation Protection and Measurements |
| NEMCON | NASA Environmental and Medical Contract |
| NPR | NASA Procedural Requirements |
| RA | Radiation Area |
| rem | Roentgen Equivalent Man |
| RRA | Radiation Restricted Area |
| RPC | Radiation Protection Committee |
| RPG | Radiation Protection Guide |
| RPO | Radiation Protection Officer |
| RSO | Radiation Safety Officer |
| RRA | Radiation Restricted Area |
| RUA | Radiation Use Authorization |
| SLD 45 | Space Launch Delta 45 |
| SNM | Special Nuclear Material |
| SOW | Statement of Work |
| TEDE | Total Effective Dose Equivalent |
| UA | Use Authorization |
| U.S. | United States |
| US/C | Use Supervisor/Custodian |
| USNRC | U.S. Nuclear Regulatory Commission |
| uSv | MicroSievert |

## Appendix C References

a. Atomic Energy Act of 1954, as amended

b. Chapter 64E-5 FAC "Control of Radiation Hazards"

c. SLD 45 INSTRUCTION 40-201 - Radiation Protection Program

d. SLD 45 REGULATION 127-1 - Range Safety Manual

e. IATA Safety Standard and Regulations for the Transport of Dangerous Goods by Air

f. International Commission on Radiological Protection Publications

g. KNPD 1800.1 “Environmental Health Program”

h. KNPD 1810.1 “KSC Occupational Medicine Program”

i. KNPD 1860.1 “KSC Radiation Protection Program”

j. "Nuclear Safety Review and Approval Procedures for Minor Radioactive Sources in Space" Guide, Approved by the Executive Office of the President, National Aeronautics and Space Council, June 15, 1970

k. International Atomic Energy Agency, Specific Safety Requirements No. 6 (SSR-6), Regulations for the Safe Transport of Radioactive Material

l. Title 21 CFR Parts 1000-1040

m. Title 29 CFR Parts 1910.96 and 1910.97

n. U.S. Department of Energy Radiological Control Criteria for Contractors and Users of Nuclear Power Systems for Space and Terrestrial Applications

o. Memorandum of Understanding Between the Department of Energy and the NASA Concerning Radioisotope Power Systems for Space Missions, July 26, 1991

p. National Security Presidential Memorandum (NSPM-20), “Presidential Memorandum on Launch of Spacecraft Containing Space Nuclear Systems,” dated August 20, 2019

q. NPR 8715.3, “NASA General Safety Program Requirements,” Chapter 6, “Nuclear Safety for Launching of Radioactive Materials.”

r. NCRP 1989, “Medical X-Ray, Electron Beam and Gamma-Ray Protection for Energies Up to 50 MeV (Equipment Design, Performance and Use)”, NCRP Report No. 102 (Bethesda, MD)

s. NCRP Report No. 147, Structural Shielding Design for Medical X-Ray Imaging Facilities (2004).

t. Federal Guidance Report No. 14, Radiation Protection Guidance for Diagnostic and interventional X-Ray Procedures (2014)

u. NUREG-1556 Volume 11, Rev. 1, Consolidated Guidance About Materials Licenses, Program-Specific Guidance About Licenses of Broad Scope, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, (2017).